

Tooth Wear Index

Procedure & Method Information

Name of Procedure/Method Tooth Wear Index

Abbreviation TWI

Purpose To assess the extent and severity of dental erosion, attrition, and abrasion.

Year of Establishment 1984

Type of Procedure/Method

Developer(s) B.G.N. Smith and J.K. Knight

Oral Condition Category

Background Information

Background Information

In 1984, the Tooth Wear Index (TWI) was introduced by B.G.N. Smith and J.K. Knight to assess the extent and severity of dental erosion, attrition, and abrasion as well as any combination of these conditions. Prior to the development of the Tooth Wear Index (TWI), a number of indices were used to record the extent of tooth tissue destruction from erosion, abrasion, and attrition; however, the etiology first had to be established before utilizing any of these indices. Also, most of these indices were used only if the corresponding condition (i.e., erosion, attrition, or abrasion) existed (Smith and Knight, 1984).

The TWI is designed for research use into the etiology, prevention, and management of tooth wear problems, and it can be implemented in epidemiological studies in addition to the long-term monitoring of tooth wear among individual patients (Smith and Knight, 1984).

The TWI is considered to be a reliable, efficient, and practical method for recording the degree of tooth wear without necessarily being able to diagnose its etiology or combined etiologies (Smith and Knight, 1984).

Changes Over Time

The TWI is still used as a dental assessment of tooth wear. However, in 1994, A. Millward, L. Shaw, A.J. Smith, J.W. Rippin, and E. Harrington modified and implemented a new scoring system to focus on tooth wear among pediatric patients.

Procedure Method

Procedure Method

The TWI is assessed by visual exam either clinically (i.e., directly from the mouth) or from photographs. Each tooth surface (i.e., the cervical surface, the buccal [labial] surface, the lingual surface, and the occlusal or incisal surface) is examined and evaluated for tooth wear and coded according to the criteria outlined below. For permanent dentition or 32 teeth, there is a possible total of 128 tooth surfaces per individual. Heavily restored surfaces and missing teeth are not recorded; however, they may be coded as "M" for missing and "R" for restored to

facilitate data recording.

Tooth Wear Index (TWI) Surface Codes and Criteria (Smith and Knight, 1984)

Code	Surface	Criteria
0	B/L/O/I C	No loss of enamel surface characteristics. No change of contour.
1	B/L/O/I C	Loss of enamel surface characteristics. Minimal loss of contour.
2	B/L/O I C	Loss of enamel exposing dentine for less than one-third of the surface. Loss of enamel just exposing dentine. Defect less than 1 mm deep.
3	B/L/O I	Loss of enamel exposing dentine for more than one-third of the surface. Loss of enamel and substantial loss of dentine, but not exposing pulp or secondary dentine.
4	C B/L/O I C	Defect 1 to 2 mm deep. Complete loss of enamel, or pulp exposure, or exposure of secondary dentine. Pulp exposure or exposure of secondary dentine. Defect more than 2 mm deep, or pulp exposure, or exposure of secondary dentine.

Note: Surfaces are abbreviated as B (buccal), L (labial), O (occlusal), I (incisal), and C (cervical).

Source: Smith BGN, Knight JK. An index for measuring the wear of teeth. Br Dent J. 1984;156:435-8.

Established Modifications

In 1994, the TWI was modified by A. Millward, L. Shaw, A.J. Smith, J.W. Rippin, and E. Harrington to examine tooth wear in children and its relationship with acidic dietary constituents.

The procedure for the modified TWI begins with proper lighting. Afterward, the teeth are dried with compressed air, and the buccal, occlusal/incisal, and lingual surfaces are examined for tooth wear. Traumatized teeth or teeth with large restorations or extensive caries are excluded. The criteria for the modified TWI are as follows:

Modified Tooth Wear Index (Millward, Shaw, Smith, Rippin, and Harrington, 1994)

Code	Surfaces	Criteria
0	B, L, O, I	No loss of enamel surface characteristics.
1	B, L, O, I	Loss of enamel surface characteristics.
2	B, L, O I	Loss of enamel, visible dentine on less than one-third of the surface. Loss of enamel with visible dentine.
3	B, L, O	Loss of enamel, visible dentine on more than a third of the surface area.
I	I	Loss of enamel and substantial loss of dentine, but not exposing pulp or secondary

dentine.

4	B, L, O	Complete loss of enamel, pulp exposure, or exposure of secondary dentine.
	I	Pulp exposure or exposure of secondary dentine.

Note: B = buccal or labial; L = lingual or palatal; O = occlusal; I = incisal.

Source: Millward A, Shaw L, Smith AJ, Rippin JW, Harrington E. The distribution and severity of tooth wear and the relationship between erosion and dietary constituents in a group of children. *Int J Paediatr Dent*. 1994 Sep;4(3):151-7.

Federal Survey Modifications

In the National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004, the oral health assessment includes a modified version of the Tooth Wear Index due to its reported levels of reproducibility and the feasibility of comparing results with other studies (NIDCR, 2001).

For all sampled persons in NHANES IV, the TWI visual examination evaluates and codes the buccal, lingual, and incisal surfaces on the four maxillary and mandibular incisors and the occlusal surface of the mandibular first molars using proper lighting and a plane surface mirror. Each tooth surface is dried prior to the examination. The criteria for the modified TWI in NHANES IV are outlined below.

Modified Tooth Wear Index (TWI) in NHANES IV (Al-Dlaigan, Shaw, and Smith, 2001)

Score	Surfaces	Criteria
1	B/L/I/O	No loss of enamel surface characteristics.
2	B/L/I/O	Loss of enamel surface characteristics.
3	B/L/O	Loss of enamel, visible dentine for less than 1/3 of the surface.
	I	Loss of enamel just exposing dentine.
4	B/L/O	Loss of enamel, visible dentine for greater than 1/3 of the surface.
	I	Loss of enamel and substantial loss of dentine but not exposure of pulp or secondary dentine.
5	B/L/O	Complete loss of enamel, or pulp exposure, or secondary dentine.
	I	Pulp exposure or exposure of secondary dentine.
9	B/L/I/O	Excluded from analysis (missing tooth, partially erupted, orthodontic bands, composite restoration, any crowns, tooth fracture, or sealant).

Note: B = Buccal; L = Lingual; O = Occlusal; I = Incisal.

Source: National Institute of Dental and Craniofacial Research. Proposal for the Oral Health Examination in the National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC, 2001.

References

References

Textbooks, Manuals, and the Internet:

National Institute of Dental and Craniofacial Research. Proposal for the Oral Health Examination in the National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC, 2001.

Journals:

Millward A, Shaw L, Smith AJ, Rippin JW, Harrington E. The distribution and severity of tooth wear and the relationship between erosion and dietary constituents in a group of children. *Int J Paediatr Dent*. 1994 Sep;4(3):151-7.

Smith BG, Knight JK. An index for measuring the wear of teeth. *Br Dent J*. 1984 Jun 23;156(12):435-8.

Validity

Reliability

Al-Dlaigan YH, Shaw L, Smith A. Dental erosion in a group of British 14-year-old school children. Part II: Influence of dietary intake. *Br Dent J*. 2001 Mar 10;190(5):258-61.

Al-Dlaigan YH, Shaw L, Smith A. Dental erosion in a group of British 14-year-old school children. Part I: Prevalence and influence of differing socioeconomic backgrounds. *Br Dent J*. 2001 Feb 10;190(3):145-9.

Bartlett DW, Coward PY, Nikkah C, Wilson RF. The prevalence of tooth wear in a cluster sample of adolescent schoolchildren and its relationship with potential explanatory factors. *Br Dent J*. 1998 Feb 14;184(3):125-9.

Listing of Publications with Surveys &

Surveys & Studies

International Surveys & Studies:

Bartlett DW, Evans DF, Anggiansah A, Smith BG. A study of the association between gastro-oesophageal reflux and palatal dental erosion. *Br Dent J*. 1996 Aug 24;181(4):125-31.

Donachie MA, Walls AW. Assessment of tooth wear in an ageing population. *J Dent*. 1995

Jun;23(3):157-64.

Madlena M, Keszthelyi G, Alberth M, Nagy A. [The attrition of deciduous teeth]. Fogorv Sz. 1989 Sep;82(9):273-6. [Article in Hungarian]

Milosevic A, Agrawal N, Redfearn P, Mair L. The occurrence of toothwear in users of ecstasy (3,4-methylenedioxymethamphetamine). Community Dent Oral Epidemiol. 1999 Aug;27(4):283-7.

Milosevic A, Brodie DA, Slade PD. Dental erosion, oral hygiene, and nutrition in eating disorders. Int J Eat Disord. 1997 Mar;21(2):195-9.

Milosevic A, Lo MS. Tooth wear in three ethnic groups in Sabah (northern Borneo). Int Dent J. 1996 Dec;46(6):572-8.

Milosevic A, Dawson LJ. Salivary factors in vomiting bulimics with and without pathological tooth wear. Caries Res. 1996;30(5):361-6.

Poynter ME, Wright PS. Tooth wear and some factors influencing its severity. Restorative Dent. 1990 Nov;6(4):8-11.

Redfearn PJ, Agrawal N, Mair LH. An association between the regular use of 3,4 methylenedioxy-methamphetamine (ecstasy) and excessive wear of the teeth. Addiction. 1998 May;93(5):745-8.

Shaw L, al-Dlaigan YH, Smith A. Childhood asthma and dental erosion. ASDC J Dent Child. 2000 Mar-Apr;67(2):102-6, 82.

Steele JG, Walls AW. Using partial recording to assess tooth wear in older adults. Community Dent Oral Epidemiol. 2000 Feb;28(1):18-25.

United States Surveys & Studies:

Gregory-Head BL, Curtis DA, Kim L, Cello J. Evaluation of dental erosion in patients with gastroesophageal reflux disease. J Prosthet Dent. 2000 Jun;83(6):675-80.

Mehta NR, Forgione AG, Maloney G, Greene R. Different effects of nocturnal parafunction on the masticatory system: the weak link theory. Cranio. 2000 Oct;18(4):280-6.

National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.